Cooperative Research and Development Agreement (CRADA)

for

On-line Continuous Water Monitoring

JESWG Briefing, 22 Mar 06

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Continuous On-line Event Monitors

A potential tool to provide early warning to avert/limit casualties and mission disruption

- Two aspects of potential technology under development:
  - Event Detection (i.e., alarm)
  - Contaminant Identification

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Preliminary Market Survey

- Air Force installations being heavily marketed by potential vendors
- AF Commanders are looking for technical advice prior to investment
- AFIOH formed CRADA with Hach HST to evaluate existing technology

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Hach HST Continuous Monitoring System

Water Distribution Monitoring Panel

Event Monitor Trigger System

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Hach HST Water Distribution Monitoring Panel

- Installed on water distribution system
- Monitors water quality properties:
  - pH
  - Electrolytic Conductivity (Ionic concentrations)
  - Chlorine
  - Turbidity
  - Total Organic Carbon

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Hach HST Event Monitor Trigger System

- Installed adjacent to Monitoring Panel
- “Learns” normal property variations of water system; considers:
  - Seasonal variation
  - Different water sources
  - Normal operational activities
- Establishes “normal” operating range for five variables
- Compares signals to reference responses of >100 characterized threat agents
- Alarms and identifies most likely contaminant when signal response indicates contamination

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CRADA

Background

- Cooperative Research and Development Agreement, CRADA# 05-HSW-02
- Signed by Hach HST, AFIOH, 311th HSW
- Effective 6 May 05, for period of 24 months

Goals

- *Government*: Gain experience/knowledge in integrating continuous monitoring technology to reduce contamination risks at minimal cost
- *Collaborator*: Test and verify integrity and robustness of continuous monitoring technology in “live” environment

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CRADA Objectives

- Deploy systems in representative, operational AF drinking water distribution systems
- Install and operate to determine system robustness and integrity
- Observe and test systems' ability to distinguish normal system variations from abnormal variations (events)
- Observe and determine AF user/operator system requirements, interface needs, and related operational integration needs

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CRADA Plan

- Testing at up to five AF sites over 24 month period
  1. Charleston AFB
  2. Nellis AFB
  3. Seymour Johnson AFB

  Two more locations TBD

- Support Memorandum Of Agreements (MOAs) to be established between 311 HSW, Hach HST, and each host installation

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Timeline for Each Test Site

- **Months 1-2**
  - MOA between 311 HSW and host base finalized
  - Host base facilitates site survey access and logistical arrangements
  - AFIOH reviews and approves site deployment plan developed by the Hach after host base coordination
- **Months 3-6**
  - Hach installs device at installation
  - Training and observation begin
  - Hach provides AFIOH with status report twice per month
- **Month 6**
  - AFIOH and Hach decide whether to continue testing at site
  - Hach provides AFIOH with a 6-month summary report
  - Hach removes equipment at the end of test
- **Month 7**
  - Continued testing for another 6 months or Hach removes equipment

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CRADA Current Status

- Charleston AFB
  - Kickoff Meeting 14 Oct
  - Planning Meeting 9 Dec
  - Installation Complete 15 Feb
- Nellis AFB
  - MOA being signed
  - Kickoff Meeting 22 Feb
- Third Test Site: Seymour Johnson AFB

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Project Issues

- Specific installation requirements were not automatically considered in planning phase
  - Base desires Trigger System separate from Monitoring Panel
- Currently not testing agent library due to perceived liability issues

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On-Going Work

- Development of testing/evaluation procedures for Continuous Water Monitoring (CWM) devices

- Research certification procedures for CWM devices
  - AF specific requirements
  - Joint Program Executive Office for Chemical and Biological Defense Equipment Review Panel requirements

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Issues/Questions

- Contaminant Coverage not Full-Spectrum
  - Biological pathogens and toxins, radionuclides, CW agents, various TICs/TIMs
- Cost—Capital, Consumables, O&M
- Systems using Chloramines vs. Chlorine; Variability in Pipe materials
- Reported Problems with online monitoring systems:
  - False Alarms
  - Extreme “normal” variations in water parameters
  - pH sensor degradation/failures
  - Calibration drift
  - D.O. & Turbidity sensor fouling
  - Data from non-responsive probe may look O.K.
  - DO and pH not good indicators for most contaminants

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Issues/Questions

- 24/7 alert mechanism for personnel on-call and who are mobile
- Can credible/false alarms be distinguished?
- Is sufficient information available for responder to quickly distinguish credible from false alarms?
- How long will it take for personnel to access and assess alarm data?
- Can O&M, Monitoring, and Response activities be effectively integrated with existing base CE/BE operations and resources?
- O&M man-hours and training requirements

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Parallel Efforts

- US EPA
  - Water Sentinel Program: detection technologies, triggers, responses; focused on civilian water systems; AFIOH listed as observer
  - Environmental Technology Verification Program: testing 20 advanced water monitoring devices; reports available from Batelle

- DoD
  - Army testing Hach HST device at fixed installations
  - Langley AFB: independent two-device demonstration

- Individual civilian utilities are purchasing or testing devices and reporting results in trade publications or industry conferences

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Future Work

- Partnership and cross feed with US Army and US EPA to leverage resources and avoid duplication of effort
  - Development of Joint Service Agent Water Monitor

- Down the Road:
  - Additional device testing to validate agent detection capabilities if necessary
    - Possibly building test loop at ECBC for DoD use
  - Incorporating devices into full spectrum threat response concept of operations (CONOPs)
    - How many? Locations? Monitoring and response protocols?
  - AF installations programming/budgeting for devices
    - Up to $100,000+ per monitoring panel initial cost
    - At least 3-5 per base

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Questions

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